

14.10 Nylon

A condensation reaction is a chemical reaction in which two molecules combine to form a larger molecule with the elimination of a small molecule such as water or ammonia.

Condensation polymerization involves a series of these condensation reactions between two monomers. Each monomer normally contains two functional groups.

Nylon is a condensation polymer. It is used as a synthetic fibre.

Aim

To prepare nylon and investigate its properties.

Apparatus and materials

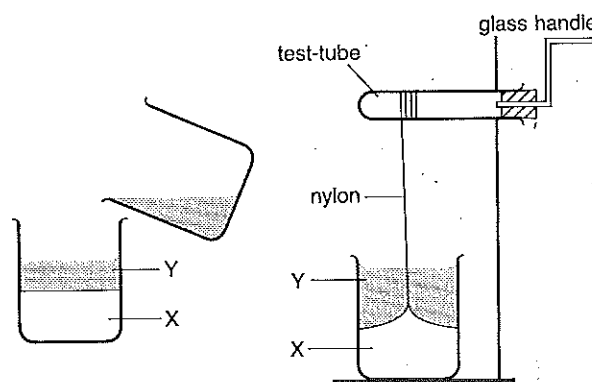
Bunsen burner and mat
Stand, boss and clamp
Beaker, 5 cm³
Glass rod shaped as a handle fitted with a cork
Tweezers
Test-tube
Tin lid
Tripod
Pair of plastic gloves
Hexanedioyl dichloride, 5% solution in 1,1,1-trichloroethane (X)
Hexane-1,6-diamine, 5% solution in water (Y)
Small pieces of poly(ethene), pvc, melamine and bakelite

Precaution

The organic chemicals used to make nylon can irritate the skin. Use plastic gloves when handling them.

Procedure

- 1 Half fill the beaker with solution X.
- 2 Slowly add solution Y until the beaker is nearly full. Do not mix the two solutions.
- 3 Place the glass handle and cork in the test-tube. Loosely clamp the test-tube.
- 4 Use a pair of tweezers to pull out the nylon at the interface between X and Y.
- 5 Drape the nylon over the test-tube. Turn the glass rod to rotate the test-tube. Take care not to let the nylon touch the side of the beaker.
- 6 Continue turning the glass handle until the supply of nylon is exhausted.
- 7 Wash the nylon in a stream of water and then allow it to dry.



- 8 Place some of the dry nylon on a tin lid together with small pieces of polythene, PVC, melamine and bakelite. Heat the samples with a small Bunsen flame. Observe which plastics melt. Do this in a fume cupboard.

Results

Stick a piece of nylon into your exercise book and label it.

The following are thermosetting plastics

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The following are thermosoftening plastics (thermoplastics)
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Questions

- 1 a) Why does nylon form at the boundary between solutions X and Y?
b) What happens when solutions X and Y are stirred with a glass rod?
c) Why is solution X placed in the beaker first?
d) Why must solutions X and Y not come into contact with your skin?
e) Compare the effect of heat on samples of nylon and melamine.
- 2 The quantity of plastics now manufactured each year exceeds the quantity of metals. However there are problems with the disposal of plastics once they have been used.
 - a) What happens to iron which has been left for many years in the open air?
 - b) Why must plastics not be burnt in the open air?
 - c) Why does plastic waste not decompose when left in rubbish dumps?
 - d) Why is plastic waste not disposed of at sea?
 - e) How can waste-plastic be recycled?